

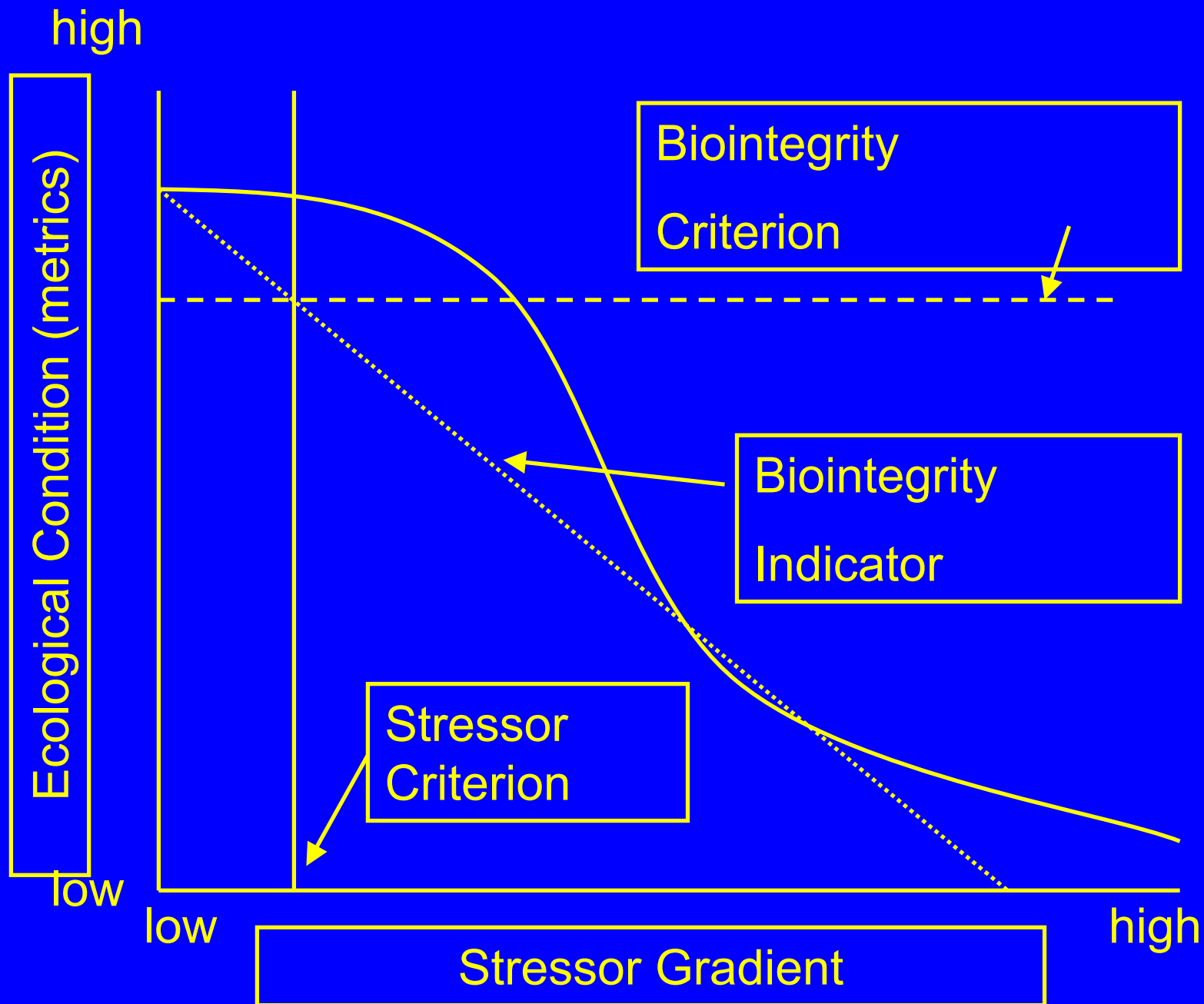
US EPA ARCHIVE DOCUMENT

Seeking Common National Assessment of the Human Disturbance Gradient

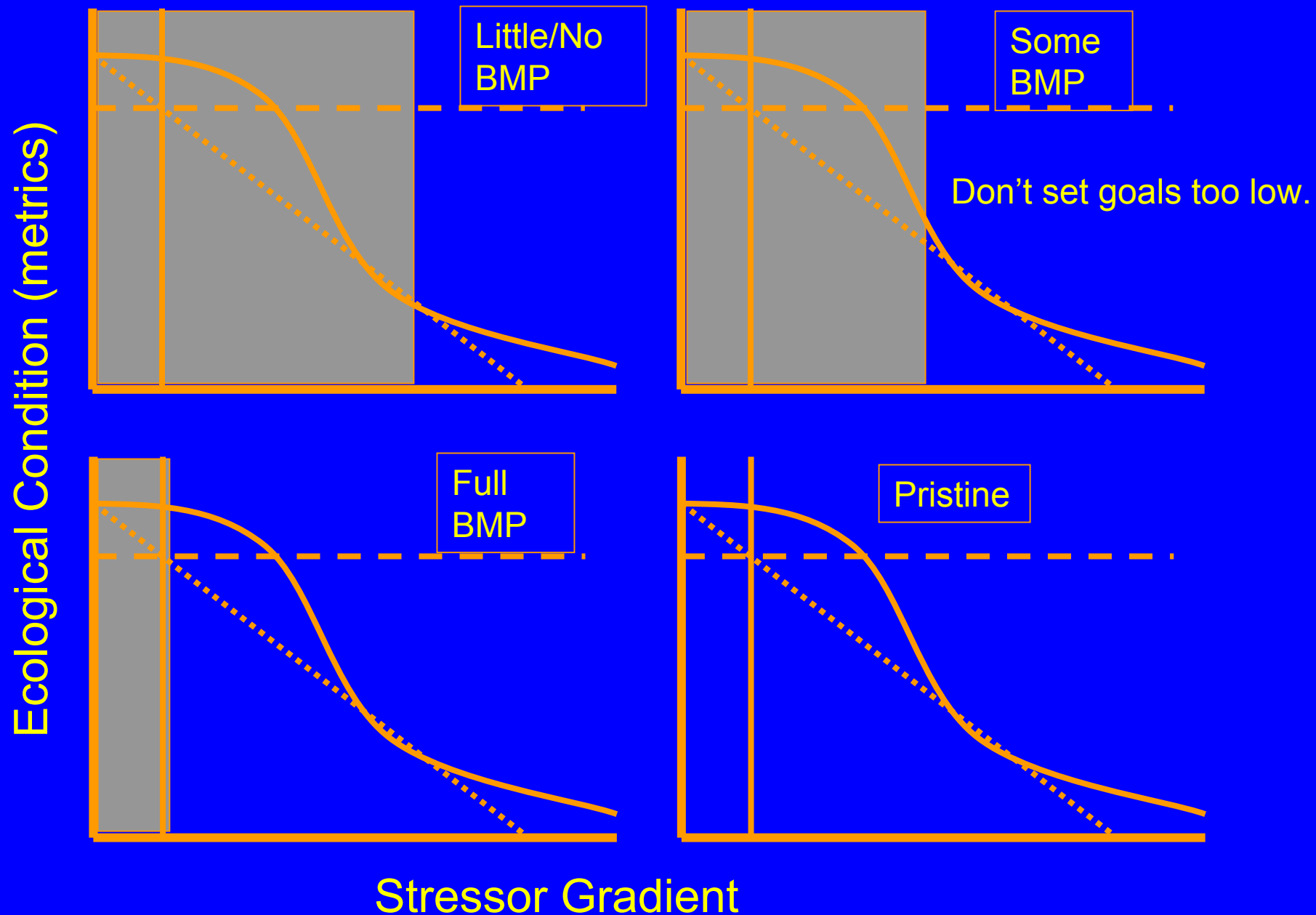
**Robert M. Hughes
(Dynamac Corporation)
&
The Aquatic Life Uses
Steering Group**

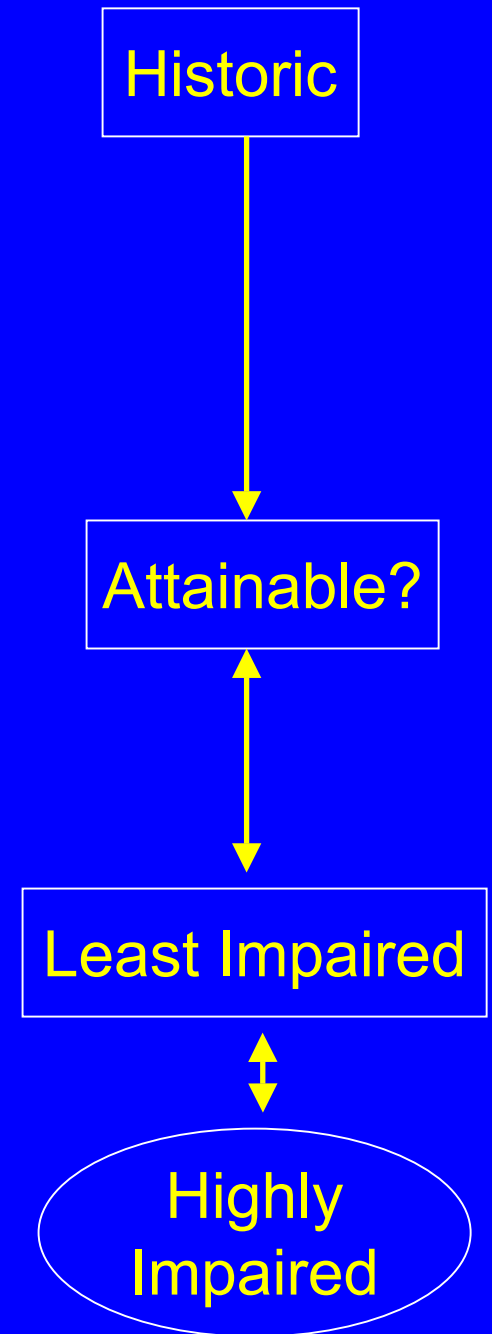
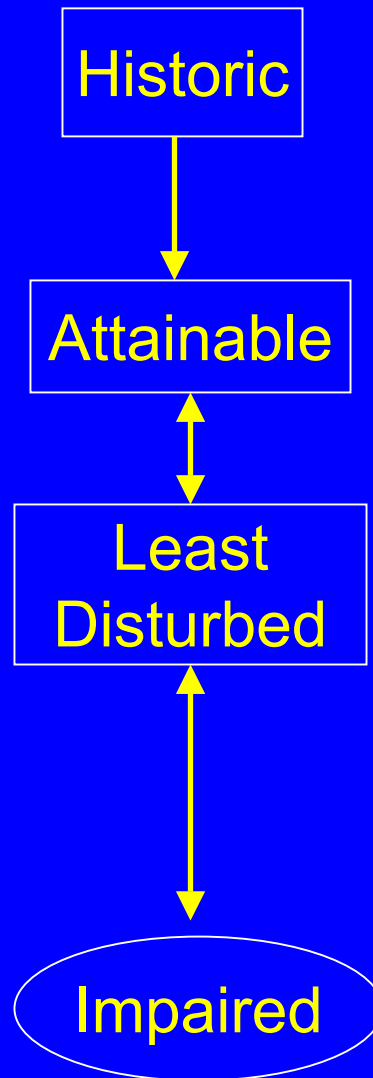
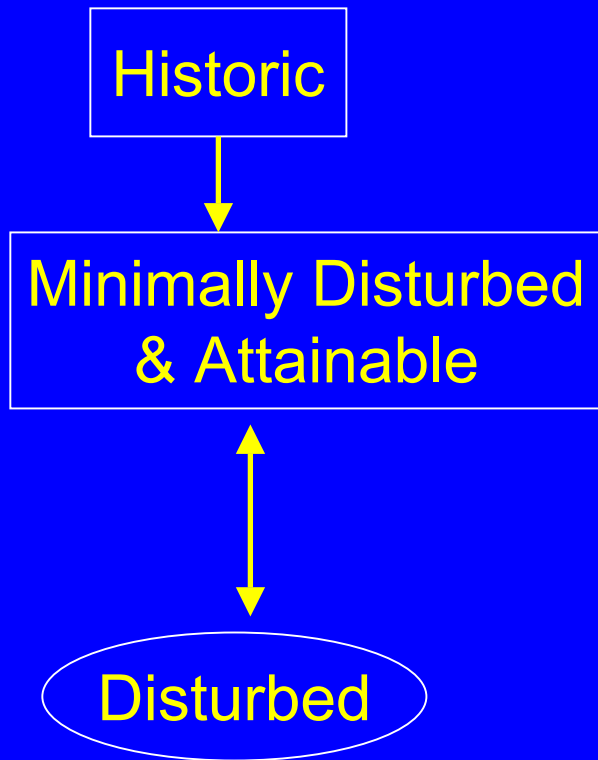
Objectives

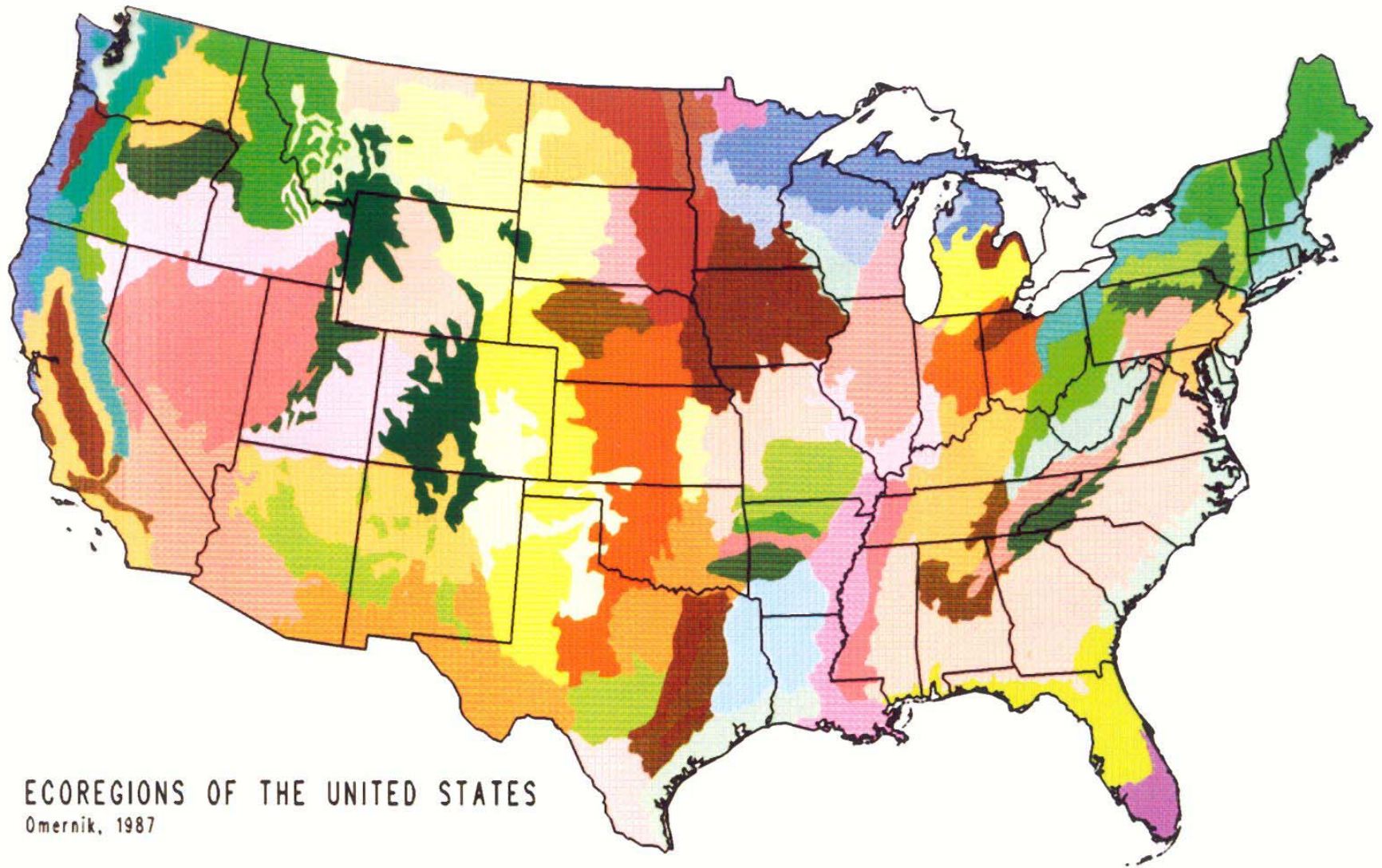
- **Provide rationale for human disturbance gradient (HDG)**
- **Summarize recent studies concerning biological responses to land use**
- **Outline key components of HDG**
- **Summarize interstate workshop results**



What we may learn as “attainable” improves with BMP implementation!







ECOREGIONS OF THE UNITED STATES
Omernik, 1987

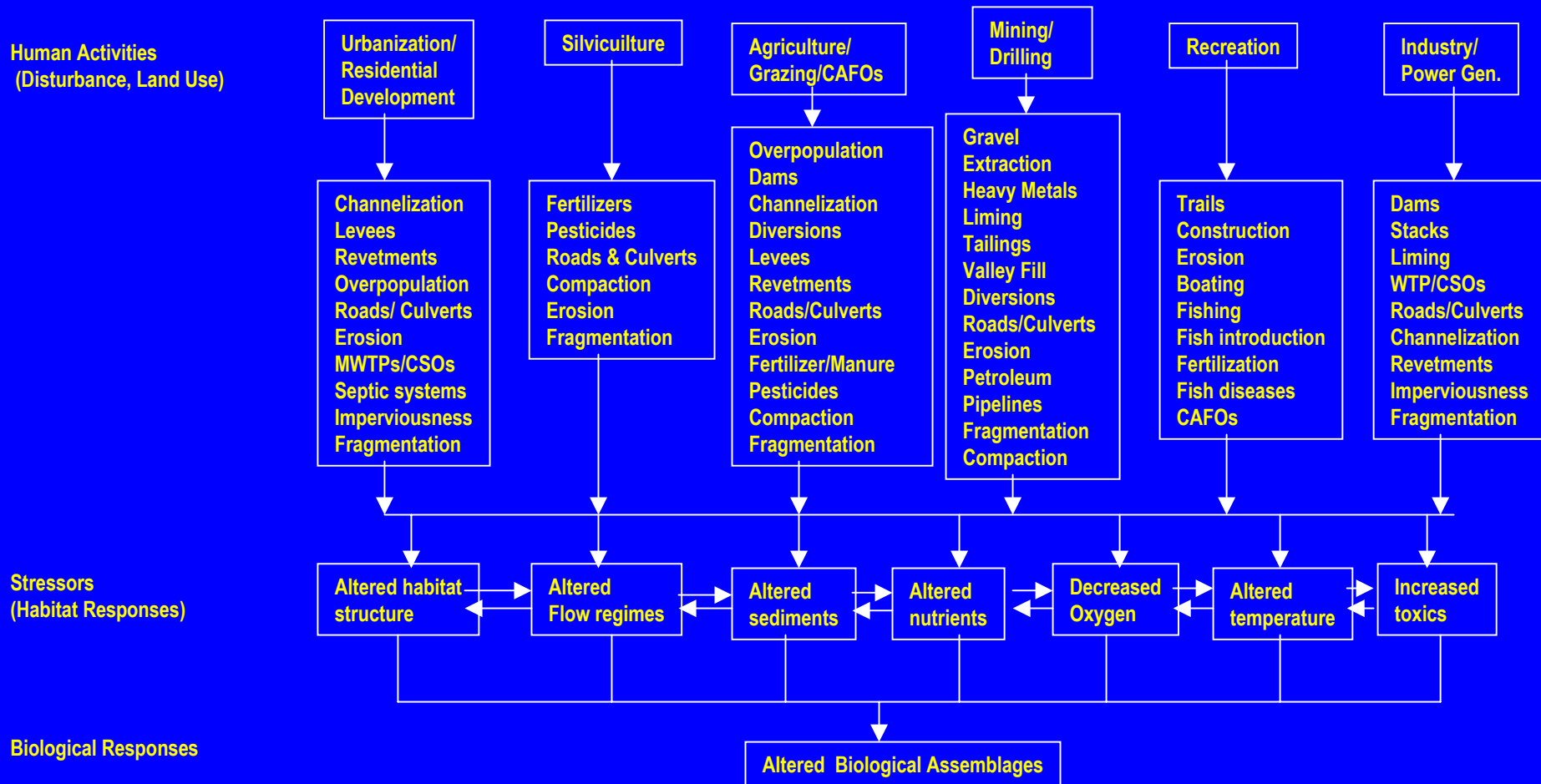
**Human Activities or Land Use
(Disturbance)**



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graph TD; A[Human Activities or Land Use (Disturbance)] --> B[Stressors (Habitat Responses)]; B --> C[Biological Responses];
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**Stressors
(Habitat Responses)**

Biological Responses

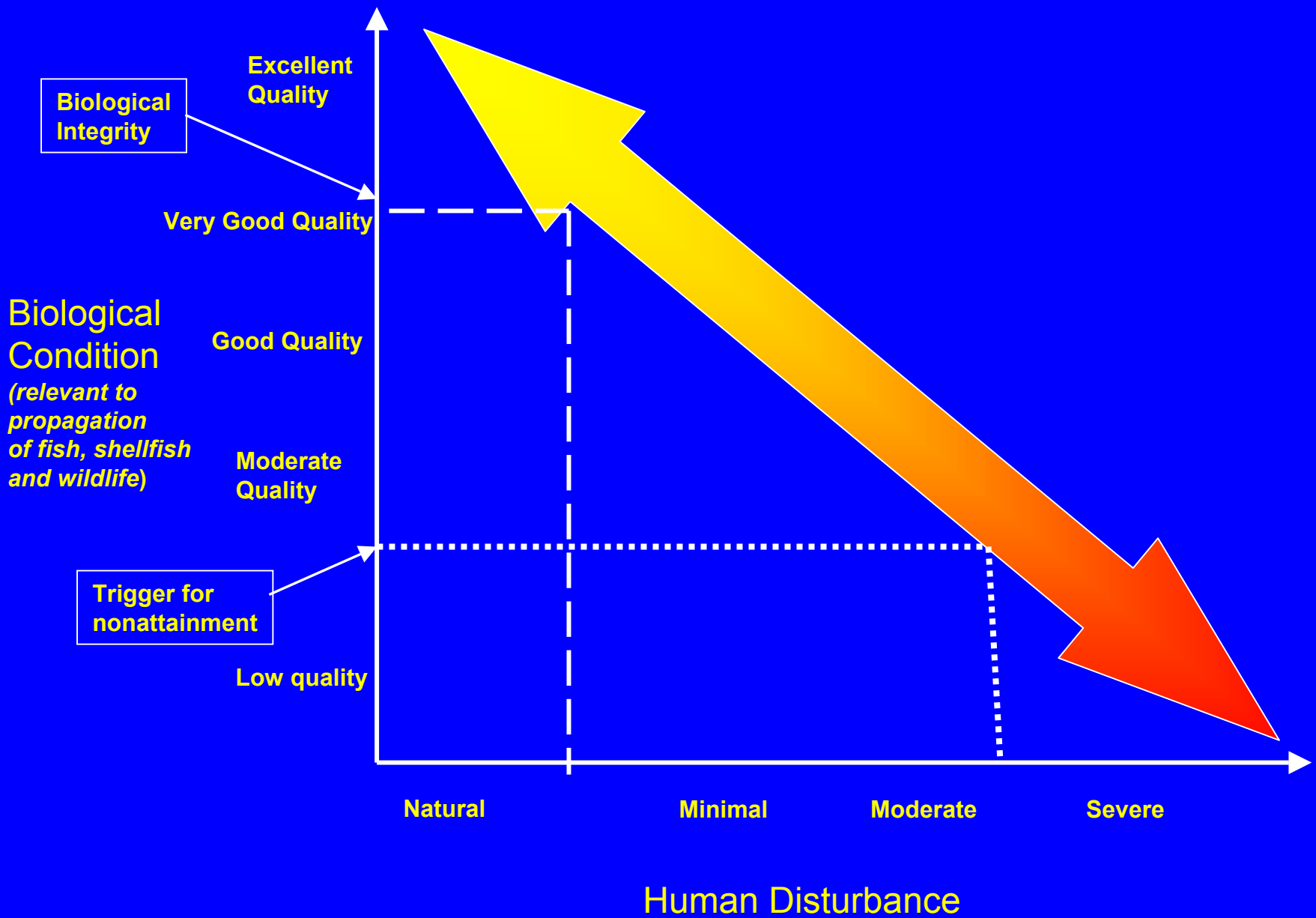


Rationale for Human Disturbance Gradient (HDG)

- **Landscape condition affects in-stream condition**
- **Human disturbance is root source of most-manageable stressors**
- **Landscape perspective is critical for stream protection and restoration**
- **Drainage perspective is necessary for understanding & conserving biota**

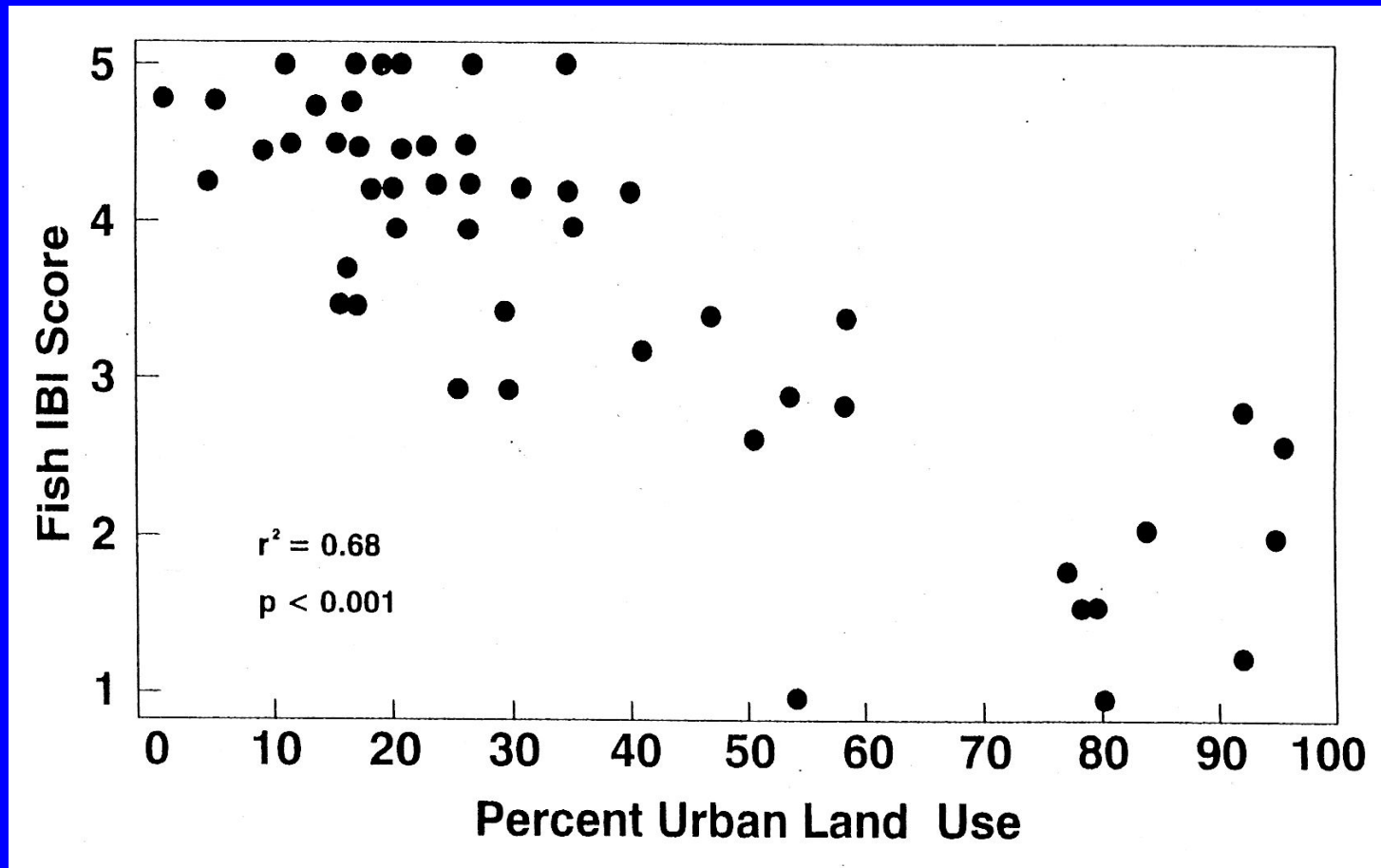
Rationale for Human Disturbance Gradient (HDG) (continued)

- Understanding landscape condition assists in diagnosing stressors
- Catchment condition often represents half the variability in biological response scores
- Catchment condition is essential for screening & selecting reference sites
- 1:1 dose responses rare; wedges & clouds common

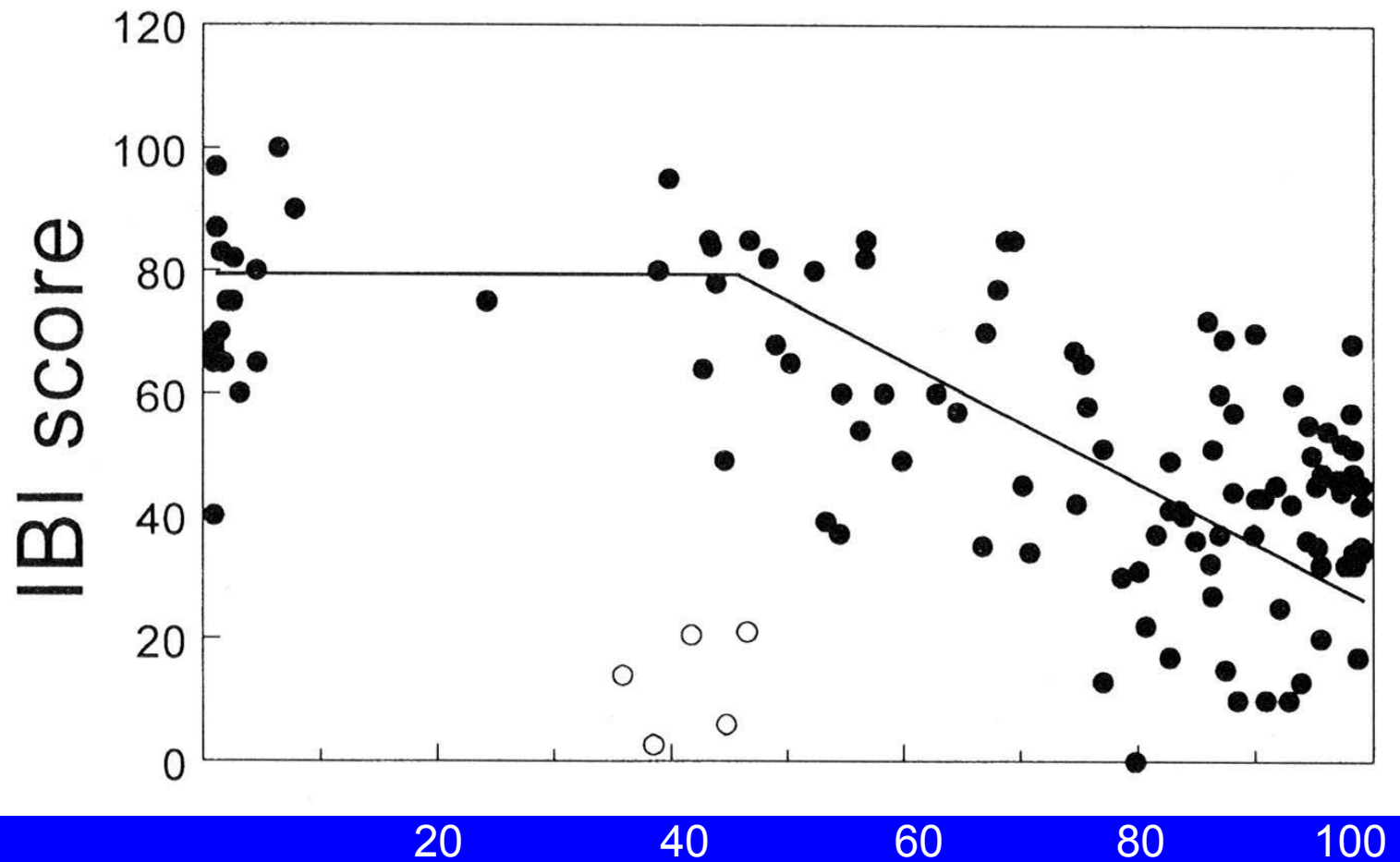


IBI vs. Catchment Land Use

- Steedman (ONT) ↓ 0-80% urban
- Roth (MI) ↓ 25-80% ag.; ↑ 0-15% urban
- Klauda (MD) ↓ 20-40% urban
- Wang(WI) ↓ >50% ag.; ↓ >10% urban
- Wang (WI) ↑ 0-90% ag.; ↓ >20% urban
- Fitzpatrick (WI) ↓ 20-60 % ag
- Karr (WA) ↓ 0-60% urban
- Snyder (WV) ↑ 35-75% ag.; ↓ 0-30% urban
- Mebane (PNW) ↑ >15% irrigated ag.
- Bryce (MAHA) ↓ >50% ag.; ↓ 10-20% mined



(from Klauda et al. 1998. Environ. Monitor. Assess. 51:299-316)



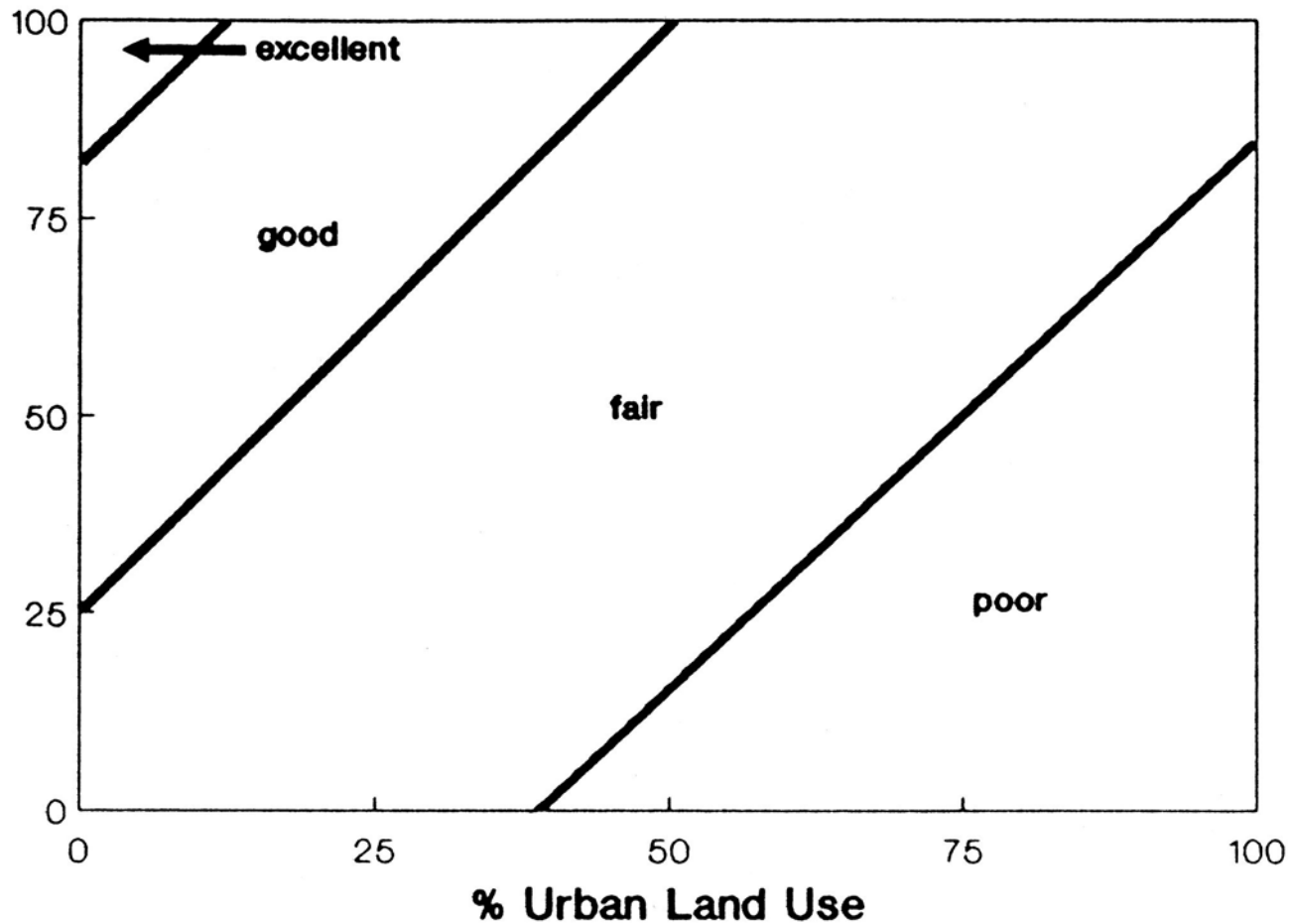
% Catchment Agricultural Land Cover

(from Wang et al. 1997. Fisheries 22(6):6-12)

IBI vs. Riparian Land Use

- Steedman (ONT) ↓ 70-100% deforested
- Roth (MI) ↓ 0-100% ag.; ↑ 0-10% urban
- Jones (GA) ↓ >2-3 km deforested
- Fitzpatrick (WI) ↓ >20% ag.
- Bryce (OR) ↓ >50% ag.; ↓ >20% urban
- Snyder (WV) NS effect

% Riparian Forest



(from Steedman. 1988. Can. J. Fish. Aquat. Sci. 45:492-501)

HDG Layout

- **Six tiers (A-F)**
- **Six major stressor classes**
 - **Habitat structure**
 - **Flow regime**
 - **Water quality**
 - **Toxics & bioengineered chemicals**
 - **Energy sources**
 - **Biotic interactions**

HDG Layout (continued)

- **Five major disturbance classes**
 - **Landscape Character**
 - **Riparian Condition**
 - **Barriers**
 - **Channel Morphology (map scale)**
 - **Atmospheric Deposition**

Increasing
Stressor
Intensity
(Catchment Scale)

Raw Clearcut
Scrub/Sapling
Open 2nd Growth
Closed 2nd Growth
Select Cut
LSOG

Silviculture

CAFO
Irrigated
Conventional
Low/no Till
Intensive Graze
High Swidden
Patch Farm
Rotated Graze
Patch Swidden

Agriculture

Industrial

Urban F
Suburban E

Large Lot Res. D

Rural Res. C
Pioneer B

A

Urbanization Tier

Workshop Summary & Future Needs

- **State participants classified site & basin data into HDG tiers**
- **80 % agreement on tiers for Northern Forest, Midwest & Southeast work groups**
- **HDG must be modified for plains, deserts & large rivers**
- **Linkages between catchment/riparian HDG & stressors must be refined**